

patches, so that one will enlarge at the expense of others. Or currents may carry the detritus into the channels or deeper waters around a coral patch, and leave little to aid the plantation itself in its increase and consolidation.

d. The course and extent of fresh waters from the land, and their detritus, should be ascertained.

e. The strength and height of the tides, and general force of the ocean waves, will have some influence.

Owing to the action of these causes, barrier reefs enlarge and extend more rapidly than inner reefs. The former have the full action of the sea to aid them, and are farther removed from the deleterious influences which may affect the latter.

No results with reference to this question of the rate of progress in reefs were arrived at by the author in the course of his observations in the Pacific. The general opinion, that their progress is exceedingly slow, was fully sustained. The facts with regard to the growth of zoöphytes give some data.

Allowing that the large *Madrepora* of the wreck, mentioned on page 99, may grow three inches in height a year, and that other Madrepores increase in the same ratio, it is still not easy to deduce from it the rate of increase of the reef. In the first place, the whole Madrepore is growing over the sides of its branches, at the rate, if we may judge from the size of the trunk at base, of a tenth of an inch a year, thus increasing annually the diameter a fifth of an inch a year, which, in a large species, is a very great addition to the three inches per year at the extremities of the branches. Again, the branches of the large Madrepore of the wreck were widely spaced, those of *M. cervicornis* having intervals of from six to eighteen inches or more between the branches.

In fact it is impossible to make any exact estimate of the amount of increase without a knowledge of the weight of the part annually added. This ascertained, it would be easy to calculate how much the added coral would, if ground up, raise the area that is covered by the Madrepore. A rough estimate gives the author an average increase to this surface of a fourth of an inch a year. But this fourth must be much